

LIVERMORE LAB REPORT

A weekly review of scientific and technological achievements from Lawrence Livermore National Laboratory, July 22-26, 2013.



WHAT MAKES AMERICA RUN



Wind power saw the highest energy gains from 2011 to 2012, according to the most recent U.S. energy flow charts released by Lawrence Livermore. Photo by Charles McGregor/LLNL

All it takes is one look at the energy flow chart for 2012 developed by Lawrence Livermore to know what the country runs on.

Americans used more natural gas, solar panels and wind turbines and less coal to generate electricity in 2012.

Natural gas use is up particularly in the electricity generation sector, where it has basically substituted directly for coal, while sustained low natural gas prices have prompted a shift from coal to gas in the electricity generating sector, according to A.J. Simon, an LLNL energy systems analyst.

The [chart](#) shows the magnitude of flow between different sources of energy and different consumers of energy. Each year, the Laboratory releases energy flow charts that track the nation's consumption of energy resources.

To hear the interview with Simon, go to [Michigan Radio](#).



Laser peening induces deep compressive stress, which significantly extends the service lifetime of turbine blades over any conventional treatment.

Rolls-Royce has extended its use of laser peening technology in the manufacture of its jet engines based on technology that was originally developed in conjunction with Lawrence Livermore.

In the peening process, high-energy laser pulses are fired at the surface of a metal part, generating pressures of one million pounds per square inch. Multiple firings of the laser in a pre-defined surface pattern impart deep levels of compressive stress that are said to provide greater resistance to potential fatigue and corrosion failures.

The approach, first introduced in the 1960s but only becoming commercially feasible more recently, has found increasing use in aerospace applications over the past decade.

To read more, go to optics.org



Lawrence Livermore's Fred Streitz and Doug East, in front of the Vulcan supercomputer, which is available to industries that can boost economic competitiveness. Photo by Laura Schulz and Meg Epperly/LLNL

What are the top 10 things industry can do to boost economic competitiveness?

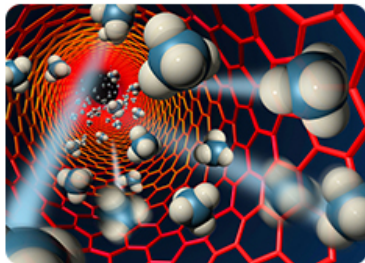
The No. 1 answer is use one of the world's fastest supercomputers.

The federal government is making one of the most powerful supercomputers in its computing arsenal available to any U.S. businesses that can help make the country more competitive.

The system is the 5 petaflop Vulcan (one petaflop equals one quadrillion floating point operations per second), an IBM Blue Gene/Q system running at the Lawrence Livermore National Lab that is ranked the eighth-fastest computer in the world, according to the latest Top 500 list.

To get time on this system, a business has to help achieve the government's mission. Its three strategic goals are straightforward: boost American competitiveness, accelerate advances in science and technology and develop the country's high-performance computing-skilled workforce.

To read more, go to [Network World](#).



Artist's rendering of a carbon nanotube that could be used to separate salt from water. Image by Scott Dougherty

Research into improving desalination of sea water has seen promising developments that might significantly reduce the cost of the process.

Putting water on a competitive basis with the current water supply could be a boon in California, which is short of water in recent years.

A technology developed at Lawrence Livermore is based on carbon nanotubes, which are special molecules made of carbon atoms in a unique arrangement. They allow liquids and gases to rapidly flow through, while the tiny pore size can block larger molecules, offering a cheaper way to remove salt from water.

The process was licensed in 2009 to a firm begun by Olga Bakajin. She was part of the Lab's research team that discovered the process.

To read more, go to [The Independent](#).



Weapons testing data is used to determine that the brain makes new neurons into adulthood. Image courtesy of National Institutes of Health.

The mushroom clouds produced by more than 500 nuclear bomb tests during the Cold War are being used by Lawrence Livermore researchers to determine whether the brain makes new neurons.

More than 50 years later, scientists have found a way to use radioactive carbon isotopes released into the atmosphere by nuclear testing to determine that the human brain produces new neurons well into late adulthood.

After working to hone their technique for more than a decade, the researchers report that a small region of the human brain involved in memory makes new neurons throughout our lives - a continuous process of self-renewal that may aid learning.

To read more, go to [Wired](#).

LLNL applies and advances science and technology to help ensure national security and global stability. Through multi-disciplinary research and development, with particular expertise in high-energy-density physics, laser science, high-performance computing and science/engineering at the nanometer/subpicosecond scale, LLNL innovations improve security, meet energy and environmental needs and strengthen U.S. economic competitiveness. The Laboratory also partners with other research institutions, universities and industry to bring the full weight of the nation's science and technology community to bear on solving problems of national importance. To send input to the *Livermore Lab Report*, send [e-mail](#)

